

Attachment for EPA Question 16 and 6(f)
Adrian 25 Central Processing Facility (CPF)

INTRODUCTION

Savoy Energy is providing emission calculations to determine if this facility is or is not a major source of Volatile Organic Compounds (VOCs) and/or a source of Hazardous Air Pollutants (HAPs). Additionally, documentation will be provided to explain the methodologies and sources of emission factors or any other assumptions. See Table 1 for a complete emission inventory.

Subject facility is located in SW/NW/NE Section 25, T6S-R3E, Adrian Township, Lenawee County, Michigan. Lat.: 41° 55' 28.763" – Long.: 84° 00' 55.554"

1.0 EMISSIONS

1.1 Engine Emissions

The primary pollutants of concern from natural gas fired engines are the oxides of nitrogen (NO_x), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) which readily forms in the high-temperature, pressure, and excess air environment found in gas firing engine processes. Natural gas fueled engines, particularly reciprocating engines emit significantly more of these pollutants than do external combustion burners (SCC Number: 2-02-002-53).

The natural gas-fired engine required at site is one, 4-stroke, 610 HP, CAT 398 TA, compressor engine. The engine is designed, and will operate 24 hours per day, 365 days per year.

1.1.2 CAT 398 TA Compressor Engine

Emission Factor (Uncontrolled) – Hydrocarbons (HC): 1.8 grams/bhp-hr x 610 hp* = 1098 grams/hr

1098 grams/hr ÷ 453.6 grams/lb = 2.42 lbs/hr*

2.42 lbs/hr x 24 hr x 365 days/yr = 21,199 lbs/yr*

21,199 lbs/yr ÷ 2000 lbs/ton = 10.60 tons/yr* HC

* Note: Emission factors are supplied by Vendor as HC and include methane and ethane.

Hazardous Air Pollutants

Emissions from analytical reports indicate that 17.622% of the total HCs are VOCs or 1.9 tons/yr. Additionally, from analytical reports total HAPs are 0.059% of the total VOCs or 0.112 tons/yr. If total VOCs are 1.8 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject engine does not require an EPA, ROP.

1.2 Glycol Dehydrator Reboiler Emissions

Prior to entering the natural gas collection pipeline (return line), the natural gas must be stripped of unwanted liquids, and dried or dehydrated to dew point levels set forth by the central processing facility. This process is accomplished by utilizing a packaged glycol dehydration unit. Regeneration of the glycol solution used for dehydrating the natural gas can, however, release volatile organic compounds. (SCC Number: 3-10-003-23 and SCC 3-10-002-27)

VOC and HAP emissions from the dehydrator reboiler are based on a GLYCalc4 report dated 11/25/13. Subject report depicted the following:

Total VOCs – 12.0248 tons/yr

Total HAPs – 3.8733 tons/yr

Maximum single HAP: Xylenes – 2.2159 tons/yr

Hazardous Air Pollutants

Emissions from GlyCalc the report indicate that total VOCs are 12.0248 tons/yr.

Total HAPs from this reboiler are 3.8733 tons/yr which is <25 tons. Maximum emissions from any single HAP (Xylenes) are 2.2159 tons/year. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject dehydrator reboiler does not require an EPA, ROP.

1.3 Glycol Dehydrator Burner (1)

VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcf Natural Gas

Fuel Gas volume (250,000 BTU/HR) / (1,000 btu/ft³) = 250 ft³/hr

(250 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0007 lbs/hr or 6.132 lbs/yr or 0.0031 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845

Hazardous Air Pollutants

Emissions from the heater indicate that total VOCs are 0.0031 tons/yr.

If total VOCs are 0.0031 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burner does not require an EPA, ROP.

1.4 Line heaters (9)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcf Natural Gas**

Fuel Gas volume (500,000 BTU/HR) / (1,000 btu/ft³) = 500 ft³/hr

(500 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0014 lbs/hr or 12.264 lbs/yr or 0.0062 tons/yr VOCs

Total all nine heaters: 0.0558 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all heaters indicate that total VOCs are 0.0588 tons/yr. If total VOCs are 0.0588 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

1.5 Heater Treaters (9)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcf Natural Gas**

Fuel Gas volume (750,000 BTU/HR) / (1,000 btu/ft³) = 750 ft³/hr
(750 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0021 lbs/hr or 18.396 lbs/yr or 0.0092 tons/yr VOCs

Total all nine heaters: 0.0828 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD, Fact Sheet #9845.

Total emissions from all heaters indicate that total VOCs are 0.0828 tons/yr. If total VOCs are 0.0828 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

* Note: Emission factor supplied by MDEQ, AQD, Fact Sheet #9845.

1.6 Oil Tanks - 400 Barrels (4)

1.6.1 Uncontrolled Fixed Roof Breathing Loss

*Emission Factor: VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)**

Storage Capacity 400 bbl x 4 tanks = 1600 bbls or 67,200 gallons crude.

VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)

VOCs = 36 x 67,200 gallons ÷ 1000 = 2,419 lbs/yr or 1.21 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 1.21 tons/yr. If total VOCs are 1.21 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.6.2 Uncontrolled Fixed Roof Working Loss

*Emission Factor: VOCs = 1.1E0 LB/E3 GAL-Yr Crude Oil (Annual Throughput)**

Crude Oil Production 500 bbl/day or 21,000 gal/day or 7.665 mm gal/yr.

VOCs = 1.1E0 LB/E3 Gal Crude Oil (Annual Throughput)

VOCs = $1.1 \times 7.665 \text{ mm gallons/yr} \div 1000 = 8,432 \text{ lbs/yr}$ or 4.216 tons/yr.

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 4.216 tons/yr. If total VOCs are 4.216 tons/yr then total HAPs from this these tanks are <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.7 Truck Loadout

Emission Factor VOCs = 2.0E0 LB/E3 Gallons Crude Oil (Annual Throughput)*

Crude Oil Throughput: 7.665 mmgal/yr

VOCs = 2.0E0 LB/E3 Gallons Crude Oil

VOCs = $2.0 \times 7.665 \text{ mmgal/yr} \div 1000 = 15,330 \text{ lbs/yr}$ or 7.665 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the truck load out indicate that total VOCs are 7.665 tons/yr. If total VOCs are 7.665 tons/yr then total HAPs from this these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject load out does not require an EPA, ROP.

1.8 Emergency Flare

*VOCs Emission Factor for combustion: 2.80E0 lb/mmcf Natural Gas**

Natural gas throughput from oil tanks: 150 mcf/day

$(150 \text{ mscf/day}) \times 2.8 \text{ lbs/mmcf} \div 1000 = 0.42 \text{ lbs/day}$ or 153.30 lbs/yr or 0.0767 tons/yr VOCs

* Note: VOC Emission factor supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the flare indicate that total VOCs are 0.0767 tons/yr. If total VOCs are 0.0767 tons/yr then total HAPs from this flare must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject flare does not require an EPA, ROP.

1.9 Fugitive Emissions

Emissions that are not, and cannot be contained or collected, and emitted through a stack or vent are defined as fugitive. Examples of fugitive emission sources would be: flanges, connectors, valves, pumps, regulators etc. associated with gas compression and the natural gas flow process at subject site. Although the number of fugitive emission sources have not been counted at subject site it can be assumed, based on counts at similar sites, that the number of fugitive sources at subject site is significantly below 1164 valves, 7671 connectors/flanges. Based on these counts fugitive emissions will be less than the following:

Equipment	E-Factor: lb/hr/source	Count	VOC Emissions lbs/hr	VOC lbs/yr	VOC tons/yr
Flanges/connectors	0.00050*	7671	3.836	33,603.40	16.799
Valves	0.00114*	1164	1.327	11,624.17	5.812
Totals			5.165	45,227.57	22.611

*Emission Factors from EPA-453/R-95-017 for flanges, valves and connectors.

Cumulative emissions from all sources including Fugitive are depicted in Table 1

Hazardous Air Pollutants

Emissions from analytical reports indicate that 0.031% of the total VOCs are Haps. Total VOCs for fugitive emissions is 22.611 tons/yr. Therefore total HAPs for fugitives are 0.7010 tons/yr. If total HAPs are 0.7010 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject fugitives do not require an EPA, ROP.

2.0 Title V Renewable Operating Permit Applicability

An emission inventory was compiled for the proposed facility, including sources exempt from the state permit system to determine whether a Title V, ROP is required.

A Title V, ROP is not required for this facility, based on uncontrolled VOC PTE less than major source levels. PTE HAPs from the above listed equipment, and from all possible leaking equipment, is less than 10 tons per year for any individual HAP, and less than 25 tons per year for total HAPs. (See Table 1).

TABLE 1

Total PTE All Emission Sources (Uncontrolled)
Adrian 25 CPF
Oil & Gas Production Facility

Equipment	VOCs Tons/ Yr	HAPs Tons/ Yr
CAT 398	1.8000	0.1062*
Dehydrator Reboiler	12.0250	0.3728
Heater Treaters (9)	0.0828	0.0049*
Dehydrator Burner	0.0031	0.0002*
Line Heaters (9)	0.0558	0.0033*
Emergency Flare	0.7670	0.0453*
Oil Tanks B/Loss (4)	1.2100	0.0714*
Oil Tanks W/Loss (4)	4.2160	0.2487*
Truck Loadout	7.6650	0.4522*
Fugitives Valves/Connections/Flanges	22.6110	1.3340*
Total	50.4357	2.639

* HAP calculations are based on subject facility lab report which indicates that 0.059% of total VOCs are considered HAPs.

Attachment for EPA Question 16 and 6(f)
Goetz 8 Central Processing Facility (CPF)

INTRODUCTION

Savoy Energy is providing emission calculations to determine if this facility is or is not a major source of Volatile Organic Compounds (VOCs) and/or a source of Hazardous Air Pollutants (HAPs). Additionally, documentation will be provided to explain the methodologies and sources of emission factors or any other assumptions. See Table 1 for a complete emission inventory.

Subject facility is located in Section 8, Adrian Township, Lenawee County, Michigan. Lat.: 41° 50' 16.035" – Long.: 84° 05' 10.200"

1.0 EMISSIONS

1.1 Engine Emissions

The primary pollutants of concern from natural gas fired engines are the oxides of nitrogen (NO_x), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) which readily forms in the high-temperature, pressure, and excess air environment found in gas firing engine processes. Natural gas fueled engines, particularly reciprocating engines emit significantly more of these pollutants than do external combustion burners.

The natural gas-fired engines required at site is one, 4-stroke, 610 BHP, CAT 398 TA, compressor engine and one 4-stroke, 445 BHP, Cummings GTA19 generator engine. These engines are designed, and will operate 24 hours per day, 365 days per year.

1.1.2 CAT 398 TA Compressor Engine

Emission Factor (Uncontrolled) – Hydrocarbons (HC): 1.8 grams/bhp-hr x 610 hp* = 1098 grams/hr

1098 grams/hr ÷ 453.6 grams/lb = 2.42 lbs/hr*

2.42 lbs/hr x 24 hr x 365 days/yr = 21,204.76 lbs/yr*

21,204.76 lbs/yr ÷ 2000 lbs/ton = 10.60 tons/yr*

* Note: Emission factors are supplied by Vendor as HC and include methane and ethane.

Hazardous Air Pollutants

Emissions from analytical reports indicate that 18.47% of the total HCs are VOCs or 1.9574 tons/yr. Additionally, from analytical reports total HAPs are 0.0093% of the total VOCs or 0.0164 tons/yr. If total HAPs are 0.0164 tons/yr then total HAPs from this engine is <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject engine does not require an EPA, ROP.

1.1.2 Cummings GTA19 Generator Engine

Emission Factor (Uncontrolled) – Hydrocarbons (NMHC): 0.42 grams/bhp-hr x 445 hp* = 187 grams/hr NMHC or VOCs

187 grams/hr ÷ 453.6 grams/lb = 0.412 lbs/hr*

0.412 lbs/hr x 24 hr x 365 days/yr = 3,609.44 lbs/yr*

3,609.44 lbs/yr ÷ 2000 lbs/ton = 1.805 tons/yr*

* Note: Emission factors are supplied by Vendor as NMHC (does not include methane).

Hazardous Air Pollutants

Emissions from analytical reports total HAPs are 0.0063% of the total VOCs or 0.057 tons/yr. If total VOCs are 1.8 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject engine does not require an EPA, ROP.

1.2 Glycol Dehydrator Reboiler Emissions

Prior to entering the natural gas collection pipeline (return line), the natural gas must be stripped of unwanted liquids, and dried or dehydrated to dew point levels set forth by the central processing facility. This process is accomplished by utilizing a packaged glycol dehydration unit. Regeneration of the glycol solution used for dehydrating the natural gas can, however, release volatile organic compounds.

VOC and HAP emissions from the dehydrator reboiler are based on a GLYCalc4 report dated 17/25/2011. Subject report depicted the following:

Total VOCs – 12.4098 tons/yr

Total HAPs – 0.6623 tons/yr

Maximum single HAP: Hexane – 0.3281 tons/yr

Hazardous Air Pollutants

Emissions from GlyCalc the report indicate that total VOCs are 12.4089 tons/yr.

Total HAPs from the reboiler are 0.6623 tons/yr which is <25 tons. Maximum emissions from any single HAP (Hexane) are 0.3281 tons/yr which is below <10 tons/yr. Both total HAPs and individual HAPS are well below the ROP threshold, thus subject dehydrator reboiler does not require an EPA, ROP.

1.3 Glycol Dehydrator Burner (1)

VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas

Fuel Gas volume (250,000 BTU/HR) / (1,000 btu/ft³) = 250 ft³/hr

(250 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0007 lbs/hr or 6.132 lbs/yr or 0.0031 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845

Hazardous Air Pollutants

Emissions from the heater indicate that total VOCs are 0.0031 tons/yr.

If total VOCs are 0.0031 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burner does not require an EPA, ROP.

1.4 Line heaters (6)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (500,000 BTU/HR) / (1,000 btu/ft³) = 500 ft³/hr
(500 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0014 lbs/hr or 12.264 lbs/yr or 0.0062 tons/yr VOCs

Total all six heaters: 0.0372 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all heaters indicate that total VOCs are 0.0372 tons/yr. If total VOCs are 0.0372 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

1.5 Heater Treaters (6)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (750,000 BTU/HR) / (1,000 btu/ft³) = 750 ft³/hr
(750 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0021 lbs/hr or 18.396 lbs/yr or 0.0092 tons/yr VOCs

Total all six heaters: 0.0552 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD, Fact Sheet #9845.

Total emissions from all heaters indicate that total VOCs are 0.0552 tons/yr. If total VOCs are 0.0552 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

* Note: Emission factor supplied by MDEQ, AQD, Fact Sheet #9845.

1.6 Oil Tanks - 400 Barrels (4)

1.6.1 Uncontrolled Fixed Roof Breathing Loss

*Emission Factor: VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)**

Storage Capacity 400 bbl x 4 tanks = 1600 bbls or 67,200 gallons crude.

VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)

VOCs = 36 x 67,200 gallons ÷ 1000 = 2,419 lbs/yr or 1.21 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 1.21 tons/yr. If total VOCs are 1.21 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.6.2 Uncontrolled Fixed Roof Working Loss

*Emission Factor: VOCs = 1.1E0 LB/E3 GAL-Yr Crude Oil (Annual Throughput)**

Crude Oil Production 100 bbl/day or 4,200 gal/day or 1.533 mmgal/yr.

VOCs = 1.1E0 LB/E3 Gal Crude Oil (Annual Throughput)

VOCs = 1.1 x 1.533 mm gal/yr ÷ 1000 = 1,686.3 lbs/yr or 0.843 tons/yr.

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 0.843 tons/yr. If total VOCs are 0.843 tons/yr then total HAPs from these tanks are <25 tons/yr and <10 tons/yr for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.7 Truck Loadout

Emission Factor VOCs = 2.0E0 LB/E3 Gallons Crude Oil (Annual Throughput)*

Crude Oil Throughput: 1.533 mmgal/yr

VOCs = 2.0E0 LB/E3 Gallons Crude Oil

VOCs = 2.0 x 1.553 mmgal/yr ÷ 1000 = 3,106 lbs/yr or 1.553 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the truck load out indicate that total VOCs are 1.553 tons/yr. If total VOCs are 1.553 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject load out does not require an EPA, ROP.

1.8 Emergency Flare

VOCs Emission Factor for combustion: 2.80E0 lb/mmcf Natural Gas*

Natural gas throughput from oil tanks: 150 mcf/day
(150 mscf/day) x 2.8 lbs/mmcf ÷ 1000 = 0.42 lbs/day or 153.30 lbs/yr or 0.0767 tons/yr VOCs

* Note: VOC Emission factor supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the flare indicate that total VOCs are 0.0767 tons/yr. If total VOCs are 0.0767 tons/yr then total HAPs from this flare must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject flare does not require an EPA, ROP.

1.9 Fugitive Emissions

Emissions that are not, and cannot be contained or collected, and emitted through a stack or vent are defined as fugitive. Examples of fugitive emission sources would be: flanges, connectors, valves, pumps, regulators etc. associated with gas compression and the natural gas flow process at subject site. Although the number of fugitive emission sources have not been counted at subject site it can be assumed, based on counts at similar sites, that the number of fugitive sources at subject site is significantly below, or 770 valves, and 5,100 connectors/flanges. Based on these counts fugitive emissions will be less than the following:

Equipment	E-Factor: lb/hr/source	Count	VOC Emissions lbs/hr	VOC lbs/yr	VOC tons/yr
Flanges/connectors	0.00050*	5,100	2.550	23,338.00	11.169
Valves	0.00114*	770	1.078	9,443.28	4.722
Totals			3.628	3,1781.28	15.891

*Emission Factors from EPA-453/R-95-017 for flanges, valves and connectors.

Cumulative emissions from all sources including Fugitive are depicted in Table 1

Hazardous Air Pollutants

Emissions from analytical reports indicate that 0.0063% of the total VOCs are Haps. Total VOCs for fugitive emissions is 15.891 tons/yr. Therefore total HAPs for fugitives are 0.1001 tons/yr. If total HAPs are 0.1001 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject fugitives do not require an EPA, ROP.

2.0 Title V Renewable Operating Permit Applicability

An emission inventory was compiled for the proposed facility, including sources exempt from the state permit system to determine whether a Title V, ROP is required.

A Title V, ROP is not required for this facility, based on uncontrolled VOC, PTE less than major source levels. PTE HAPs from the above listed equipment, and from all possible leaking equipment, is less than 10 tons per year for any individual HAP, and less than 25 tons per year for total HAPs. (See Table 1).

TABLE 1

Total PTE All Emission Sources (Uncontrolled)

Goetz 8 CPF

Oil & Gas Production Facility

Equipment	VOCs Tons/ Yr	HAPs Tons/ Yr
CAT 398	2.6000	0.0242*
Cummings GTA19	1.8050	0.0168*
Dehydrator Reboiler	12.4098	0.6623
Heater Treaters (6)	0.0552	0.0005*
Dehydrator Burner	0.0031	Nil*
Line Heaters (6)	0.0372	0.0002*
Emergency Flare	0.7670	0.0071*
Oil Tanks B/Loss (4)	1.2100	0.0113*
Oil Tanks W/Loss (4)	0.8430	0.0078*
Truck Loadout	1.5530	0.0144*
Fugitives Valves/Connections/Flanges	15.8910	0.1478*
Total	37.1774	0.8924

* HAP calculations are based on subject facility lab report which indicates that 0.0093% of total VOCs are considered HAPs.

Attachment for EPA Question 16 and 6(f)
Ruesink 16 Central Processing Facility (CPF)

INTRODUCTION

Savoy Energy is providing emission calculations to determine if this facility is or is not a major source of Volatile Organic Compounds (VOCs) and/or a source of Hazardous Air Pollutants (HAPs). Additionally, documentation will be provided to explain the methodologies and sources of emission factors or any other assumptions. See Table 1 for a complete emission inventory.

Subject facility is located in Section 26, Adrian Township, Lenawee County, Michigan.

1.0 EMISSIONS

1.1 Engine Emissions

The primary pollutants of concern from natural gas fired engines are the oxides of nitrogen (NO_x), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) which readily forms in the high-temperature, pressure, and excess air environment found in gas firing engine processes. Natural gas fueled engines, particularly reciprocating engines emit significantly more of these pollutants than do external combustion burners.

The natural gas-fired engines required at site is one, 4-stroke, 95 BHP, CAT 3304 NA, compressor engine. This engine is designed, and will operate 24 hours per day, 365 days per year.

1.1.2 CAT 3304 Compressor Engine

Emission Factor (Uncontrolled) – VOCs (NMHC): $0.36 \text{ grams/bhp-hr} \times 95 \text{ hp}^* = 34.2 \text{ grams/hr}$

$34.2 \text{ grams/hr} \div 453.6 \text{ grams/lb} = 0.0754 \text{ lbs/hr}^*$

$0.075 \text{ lbs/hr} \times 24 \text{ hr} \times 365 \text{ days/yr} = 660.50 \text{ lbs/yr}^*$

$660.50 \text{ lbs/yr} \div 2000 \text{ lbs/ton} = 0.33 \text{ tons/yr}^*$

* Note: Emission factors are supplied by Vendor as NMHC and do not include methane.

Hazardous Air Pollutants

Emissions from analytical reports indicate that 20.24% of the total HCs are VOCs or 0.33 tons/yr. Additionally, from analytical reports total HAPs are 0.046% of the total VOCs or 0.015 tons/yr. If total HAPs are 0.015 tons/yr then total HAPs from this engine is <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject engine does not require an EPA, ROP.

1.2 Line Heater Emissions (8)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (500,000 BTU/HR) / (1,000 btu/ft³) = 500 ft³/hr
(500 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0014 lbs/hr or 12.264 lbs/yr or 0.0062 tons/yr VOCs

Total all eight heaters: 0.0496 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all heaters indicate that total VOCs are 0.0496 tons/yr. If total VOCs are 0.0496 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

1.3 Heater Treater Emissions (8)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (750,000 BTU/HR) / (1,000 btu/ft³) = 750 ft³/hr
(750 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0021 lbs/hr or 18.396 lbs/yr or 0.0092 tons/yr VOCs

Total all eight heaters: 0.0736 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD, Fact Sheet #9845.

Total emissions from all heaters indicate that total VOCs are 0.0736 tons/yr. If total VOCs are 0.0736 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

* Note: Emission factor supplied by MDEQ, AQD, Fact Sheet #9845.

1.4 Oil Tanks - 400 Barrels (4)

1.4.1 Uncontrolled Fixed Roof Breathing Loss

*Emission Factor: VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)**

Storage Capacity 400 bbl x 4 tanks = 1600 bbls or 67,200 gallons crude.
VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)
VOCs = 36 x 67,200 gallons ÷ 1000 = 2,419 lbs/yr or 1.21 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 1.21 tons/yr. If total VOCs are 1.21 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.4.2 Uncontrolled Fixed Roof Working Loss

*Emission Factor: VOCs = 1.1E0 LB/E3 GAL-Yr Crude Oil (Annual Throughput)**

Crude Oil Production 128 bbl/day or 5,376 gal/day or 1.962 mmgal/yr.

VOCs = 1.1E0 LB/E3 Gal Crude Oil (Annual Throughput)

VOCs = $1.1 \times 1.962 \text{ mm gal/yr} \div 1000 = 1,962.24 \text{ lbs/yr}$ or 0.981 tons/yr.

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 0.981 tons/yr. If total VOCs are 0.981 tons/yr then total HAPs from these tanks are <25 tons/yr and <10 tons/yr for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.5 Truck Loadout

Emission Factor VOCs = 2.0E0 LB/E3 Gallons Crude Oil (Annual Throughput)*

Crude Oil Throughput: 1.962 mmgal/yr

VOCs = 2.0E0 LB/E3 Gallons Crude Oil

VOCs = $2.0 \times 1.962 \text{ mmgal/yr} \div 1000 = 3,924 \text{ lbs/yr}$ or 1.962 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the truck load out indicate that total VOCs are 1.962 tons/yr. If total VOCs are 1.962 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject load out does not require an EPA, ROP.

1.6 Emergency Flare

*VOCs Emission Factor for combustion: 2.80E0 lb/mmcf Natural Gas**

Natural gas throughput from oil tanks: 150 mcf/day

$(150 \text{ mscf/day}) \times 2.8 \text{ lbs/mmcf} \div 1000 = 0.42 \text{ lbs/day}$ or 153.30 lbs/yr or 0.0767 tons/yr VOCs

* Note: VOC Emission factor supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the flare indicate that total VOCs are 0.0767 tons/yr. If total VOCs are 0.0767 tons/yr then total HAPs from this flare must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject flare does not require an EPA, ROP.

1.7 Fugitive Emissions

Emissions that are not, and cannot be contained or collected, and emitted through a stack or vent are defined as fugitive. Examples of fugitive emission sources would be: flanges, connectors, valves, pumps, regulators etc. associated with gas compression and the natural gas flow process at subject site. Although the number of fugitive emission sources have not been counted at subject site it can be assumed, based on counts at similar sites, that the number of fugitive sources at subject site is significantly below, or 700 valves, and 4000 connectors/flanges. Based on these counts fugitive emissions will be less than the following:

Equipment	E-Factor: lb/hr/source	Est. Count	VOC Emissions lbs/hr	VOC lbs/yr	VOC tons/yr
Flanges/connectors	0.00050*	4,000	2.000	17,520.00	11.169
Valves	0.00114*	700	0.798	6990.48	3.495
Totals			2.798	24,510.48	14.664

*Emission Factors from EPA-453/R-95-017 for flanges, valves and connectors.

Cumulative emissions from all sources including Fugitive are depicted in Table 1

Hazardous Air Pollutants

Emissions from analytical reports indicate that 0.046% of the total VOCs are Haps. Total VOCs for fugitive emissions is 14.664 tons/yr. Therefore total HAPs for fugitives are 0.6745 tons/yr. If total HAPs are 0.6745 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject fugitives do not require an EPA, ROP.

2.0 Title V Renewable Operating Permit Applicability

An emission inventory was compiled for the proposed facility, including sources exempt from the state permit system to determine whether a Title V, ROP is required.

A Title V, ROP is not required for this facility, based on uncontrolled, VOC PTE less than major source levels. PTE HAPs from the above listed equipment, and from all possible leaking equipment, is less than 10 tons per year for any individual HAP, and less than 25 tons per year for total HAPs. (See Table 1).

TABLE 1

Total PTE All Emission Sources (Uncontrolled)

Ruesink 16 CPF
Oil & Gas Production Facility

Equipment	VOCs Tons/ Yr	HAPs Tons/ Yr
CAT 3304	0.3300	0.0152*
Heater Treaters (8)	0.0736	0.0034*
Line Heaters (8)	0.0496	0.0023*
Emergency Flare	0.0767	0.0035*
Oil Tanks B/Loss (4)	1.2100	0.0556*
Oil Tanks W/Loss (4)	0.9810	0.0451*
Truck Loadout	1.9620	0.0903*
Fugitives - Valves/Connections/Flanges	15.8910	0.7311*
Total	20.5739	0.9465*

* HAP calculations are based on subject facility lab report which indicates that 0.046% of total VOCs are considered HAPs.

Attachment for EPA Question 16 and 6(f)
Warner 22 Central Processing Facility (CPF)

INTRODUCTION

Savoy Energy is providing emission calculations to determine if this facility is or is not a major source of Volatile Organic Compounds (VOCs) and/or a source of Hazardous Air Pollutants (HAPs). Additionally, documentation will be provided to explain the methodologies and sources of emission factors or any other assumptions. See Table 1 for a complete emission inventory.

Subject facility is located in Section 22, Adrian Township, Lenawee County, Michigan.

1.0 EMISSIONS

1.1 Engine Emissions

The primary pollutants of concern from natural gas fired engines are the oxides of nitrogen (NO_x), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) which readily forms in the high-temperature, pressure, and excess air environment found in gas firing engine processes. Natural gas fueled engines, particularly reciprocating engines emit significantly more of these pollutants than do external combustion burners.

The natural gas-fired engines required at site is one, 4-stroke, 120 BHP, Waukesha F1197G, compressor engine. This engine is designed, and will operate 24 hours per day, 365 days per year.

1.1.2 Waukesha F1197G Compressor Engine

Emission Factor (Uncontrolled) – VOCs: 30.2 lb/mmcf natural gas burned

Fuel Usage: 8.4 mcf/hr

$0.0084 \text{ mmcf/hr} \times 30.2 \text{ lb/mmcf} = 0.2537 \text{ lbs/hr}^*$

$0.2537 \text{ lbs/hr} \times 24 \text{ hr} \times 365 \text{ days/yr} = 2,222.24 \text{ lbs/yr}^*$

$2,222.24 \text{ lbs/yr} \div 2000 \text{ lbs/ton} = 1.1111 \text{ tons/yr VOCs}^*$

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

VOC emissions from the engine are 1.1111 tons/yr. Total HAPs were calculated at 0.049% of total VOCs or 0.0544 tons/yr. If total HAPs are 0.0544 tons/yr then total HAPs from this engine is <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPs are well below the Renewable Operating Permit (ROP) threshold, therefore subject engine does not require an EPA, ROP.

1.2 Line Heater Emissions (9)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (500,000 BTU/HR) / (1,000 btu/ft³) = 500 ft³/hr
(500 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0014 lbs/hr or 12.264 lbs/yr or 0.0062 tons/yr VOCs

Total all nine heaters: 0.0558 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all heaters indicate that total VOCs are 0.0558 tons/yr. If total VOCs are 0.0558 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

1.3 Heater Treater Emissions (9)

*VOCs Emission Factor for burners/heaters: 2.80E0 lb/mmcft Natural Gas**

Fuel Gas volume (750,000 BTU/HR) / (1,000 btu/ft³) = 750 ft³/hr
(750 ft³/hr) / (1,000,000 ft³) x 2.8 VOCs = 0.0021 lbs/hr or 18.396 lbs/yr or 0.0092 tons/yr VOCs

Total all nine heaters: 0.0828 tons/yr VOCs

* Note: Emission factor for VOCs supplied by MDEQ, AQD, Fact Sheet #9845.

Total emissions from all heaters indicate that total VOCs are 0.0828 tons/yr. If total VOCs are 0.0828 tons/yr then total HAPs from this heater must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject burners/heaters do not require an EPA, ROP.

* Note: Emission factor supplied by MDEQ, AQD, Fact Sheet #9845.

1.4 Oil Tanks - 400 Barrels (4)

1.4.1 Uncontrolled Fixed Roof Breathing Loss

*Emission Factor: VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)**

Storage Capacity 400 bbl x 4 tanks = 1600 bbls or 67,200 gallons crude.

VOCs = 3.6E1 LB/KGAL-Yr Crude Oil (Storage Capacity)

VOCs = 36 x 67,200 gallons ÷ 1000 = 2,419 lbs/yr or 1.21 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 1.21 tons/yr. If total VOCs are 1.21 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.4.2 Uncontrolled Fixed Roof Working Loss

*Emission Factor: VOCs = 1.1E0 LB/E3 GAL-Yr Crude Oil (Annual Throughput)**

Crude Oil Production 717 bbl/day or 30,103 gal/day or 10.988 mmgal/yr.

VOCs = 1.1E0 LB/E3 Gal Crude Oil (Annual Throughput)

VOCs = $1.1 \times 10.988 \text{ mm gal/yr} \div 1000 = 12,087 \text{ lbs/yr}$ or 6.0434 tons/yr.

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from all crude oil tanks indicate that total VOCs are 6.0434 tons/yr. If total VOCs are 6.0434 tons/yr then total HAPs from these tanks are <25 tons/yr and <10 tons/yr for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject tanks do not require an EPA, ROP.

1.5 Truck Loadout

Emission Factor VOCs = 2.0E0 LB/E3 Gallons Crude Oil (Annual Throughput)*

Crude Oil Throughput: 6.0434 mmgal/yr

VOCs = $2.0 \times 6.0434 \text{ mmgal/yr} \div 1000 = 12,086 \text{ lbs/yr}$ or 6.043 tons/yr

* Note: Emission factor for VOCs supplied by MDEQ AQD, Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the truck load out indicate that total VOCs are 6.043 tons/yr. If total VOCs are 6.043 tons/yr then total HAPs from these tanks must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPs are well below the ROP threshold, therefore subject load out does not require an EPA, ROP.

1.6 Emergency Flare

*VOCs Emission Factor for combustion: 2.80E0 lb/mmcf Natural Gas**

Natural gas throughput from oil tanks: 150 mcf/day

$(150 \text{ mscf/day}) \times 2.8 \text{ lbs/mmcf} \div 1000 = 0.42 \text{ lbs/day}$ or 153.30 lbs/yr or 0.0767 tons/yr VOCs

* Note: VOC Emission factor supplied by MDEQ, AQD Fact Sheet #9845.

Hazardous Air Pollutants

Total emissions from the flare indicate that total VOCs are 0.0767 tons/yr. If total VOCs are 0.0767 tons/yr then total HAPs from this flare must be <25 tons/yr and <10 tons for any individual HAP. Both total HAPs and individual HAPS are well below the ROP threshold, therefore subject flare does not require an EPA, ROP.

1.7 Fugitive Emissions

Emissions that are not, and cannot be contained or collected, and emitted through a stack or vent are defined as fugitive. Examples of fugitive emission sources would be: flanges, connectors, valves, pumps, regulators etc. associated with gas compression and the natural gas flow process at subject site. Although the number of fugitive emission sources have not been counted at subject site it can be assumed, based on counts at similar sites, that the number of fugitive sources at subject site is significantly below 700 valves, and 4000 connectors/flanges. Based on these counts fugitive emissions will be less than the following:

Equipment	E-Factor: lb/hr/source	Est. Count	VOC Emissions lbs/hr	VOC lbs/yr	VOC tons/yr
Flanges/connectors	0.00050*	4,000	2.000	17,520.00	8.760
Valves	0.00114*	700	0.798	6990.48	3.495
Totals			2.798	24,510.48	12.255

*Emission Factors from EPA-453/R-95-017 for connectors/flanges, valves.

Cumulative emissions from all sources including Fugitive are depicted in Table 1

Hazardous Air Pollutants

Emissions from analytical reports indicate that 0.049% of the total VOCs are Haps. Total VOCs for fugitive emissions is 12.255 tons/yr. Therefore total HAPs for fugitives are 0.600.50 tons/yr. If total HAPs are 0.6745 tons/yr then total HAPs from this engine must be <25 tons and <10 tons/yr for any single HAP. Both total HAPs and individual HAPS are well below the Renewable Operating Permit (ROP) threshold, therefore subject fugitives do not require an EPA, ROP.

2.0 Title V Renewable Operating Permit Applicability

An emission inventory was compiled for the proposed facility, including sources exempt from the state permit system to determine whether a Title V, ROP is required.

A Title V, ROP is not required for this facility, based on uncontrolled, VOC PTE less than major source levels. PTE HAPs from the above listed equipment, and from all possible leaking equipment, is <10 tons per year for any individual HAP, and <25 tons per year for total HAPs. (See Table 1).

TABLE 1

Total PTE All Emission Sources (Uncontrolled)

Warner 22 CPF
Oil & Gas Production Facility

Equipment	VOCs Tons/ Yr	HAPs Tons/ Yr
CAT 3304	0.1111	0.0054*
Heater Treaters (8)	0.0828	0.0041*
Line Heaters (8)	0.0558	0.0027*
Emergency Flare	0.0767	0.0038*
Oil Tanks B/Loss (4)	1.2100	0.0593*
Oil Tanks W/Loss (4)	6.0434	0.2961*
Truck Loadout	6.0430	0.2961*
Fugitives - Valves/Connections/Flanges	12.2550	0.6005*
Total	25.8578	1.2680*

* HAP calculations are based on subject facility lab report which indicates that 0.049% of total VOCs are considered HAPs.